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FIVE YEAR REVIEW

**LANDFILL AND RESOURCE RECOVERY SUPERFUND SITE
NORTH SMITHFIELD, RHODE ISLAND**

SEPTEMBER 1999

**U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION I - NEW ENGLAND**

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1.0 Introduction

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Section 121(C), and Section 300.430(f)(4)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), requires a five year review of remedial actions selected on or after October 17, 1986. This report summarizes the results of this review which was conducted in accordance with OSWER Directive 9355.7-02, *Structure and Components of Five Year Reviews* (May 23, 1991) and OSWER Directive 9355.7-02A *Supplemental Five-Year Review Guidance* (July 23, 1994). Since the Record of Decision (ROD) was signed on September 29, 1988 (post-SARA remedy), and the remedy will not allow unlimited use and unrestricted exposure, this review is a Statutory Review.

The objective of this review is to evaluate the effectiveness of the selected remedy and to determine if it remains protective of human health and the environment.

2.0 Site Conditions

Background. Landfill and Resource Recovery Site (L&RR) is a 28-acre closed landfill located in North Smithfield, Rhode Island near the junction of Pound Hill Road and Old Forge Road (alternatively referred to as Old Oxford Turnpike). The Site is a former sand and gravel pit that reportedly began accepting residential wastes for disposal around 1927. Over the years, the landfill accepted commercial and industrial waste. It is believed that hazardous materials were co-disposed with the municipal solid wastes. The landfill ceased accepting waste in January, 1985.

Landfill closure began in 1985 pursuant to a 1983 Court Order and Consent Order and Agreement between L&RR, Inc. and RIDEM. EPA was not a party to the 1983 Court Order. In 1983, the Site was placed on the National Priorities List (NPL). In 1986, under the direction of RIDEM, the owners of the landfill covered a majority of the landfill with a 20-mil PVC geomembrane and soil. A system of 18 gas vents was also installed. EPA initiated the Remedial Investigation/Feasibility Study (RI/FS) process under CERCLA in May 1986. The RI/FS and remedy selection process was concluded in September 1988 with issuance of the Record of Decision (ROD).

The media of concern at the Site included groundwater, surface water and ambient air. There are several homes near the landfill that have private wells and use groundwater as a source of drinking water. The landfill is located over the Slatersville Aquifer which has been designated as a drinking water source by the State of Rhode Island.

In 1994 and 1995, under a Unilateral Administrative Order from EPA, the Potentially Responsible Parties (PRPs) upgraded the landfill cover, improved the surface water management system, and constructed the landfill gas collection and treatment system. The L&RR landfill is currently producing landfill gas due to the decomposition of the municipal solid wastes contained within. The rate extracted from the collection system is approximately 560 ± 70 cubic feet per minute (cfm). Prior to construction of the landfill gas control system, this gas was discharged directly to the ambient air.

In October 1997, EPA, the State and PRPs entered into a Settlement Agreement and Consent Decree to perform the post-closure operation and maintenance at the Site. The Post-Closure Operation and Maintenance Plan (O&M Plan), dated September 1996, governs performance of the long-term O&M activities, which are documented in the Monthly Progress Reports as well as the Post-Closure Site Monitoring Reports.

Remedial Objectives. Three major components of the Remedial Action are listed in the Settlement Agreement and Consent Decree:

- Upgrading the Landfill Closure. This includes: improving side slopes, installation of a synthetic cover on the northeast area, increasing soil cover thickness to 24 inches and completing the vegetative cover, upgrading the surface water runoff system, installation of a perimeter fence, and establishing institutional controls.
- Collecting and treating the Landfill gas. This includes utilizing a thermal destruction technology to reduce the release of volatile organic compounds to the ambient air.
- Post-closure inspection, operation and maintenance. This includes O&M of the Landfill cap, and the gas collection and treatment system, and long term monitoring of: the ground and surface waters, the landfill gas emissions and migration, and the ambient air.

Performance standards developed as part of the design were prepared to respond to the remedial response objectives for the Remedial Action of the Site including:

1. Remediate the Site so that federal and state applicable or relevant and appropriate standards, requirements, criteria and limitations are met and to insure that the Site is protective of human health and the environment;
2. Reduce present and future impacts to wetlands due to sedimentation of eroded landfill cover material; and
3. Remediate landfill gas so that volatile organic compound concentrations in ambient air are reduced and risks to public health and the environment are minimized.

Construction Activities: Remedial Design activities began in March 1993 and concluded in September 1994. Remedial Action construction activities began in May 1994 and concluded with the Demonstration of Compliance testing and startup of the landfill gas collection and treatment system (i.e. enclosed flare) in February 1995. The L&RR Settling Defendants, EPA and RIDEM conducted the Pre-Final Site Inspection on July 19, 1995. Following implementation of corrective action to address the landfill gas (LFG) migration, the Final Site Inspection was conducted on November 1, 1996.

The Preliminary Close Out Report issued by EPA, Region 1, on February 24, 1997, documents activities and schedule for site completion; issues noted during the Final Site Inspection have been resolved. Remedial Action Report issued by EPA, Region 1, on September 4, 1997 more fully documents construction activities and includes a certification that the Remedial Action was performed in accordance with the design documents and specifications and the remedy is operational and functional.

Post-Closure Operation and Maintenance: The Post-Closure Operation & Maintenance Plan (PC O&M Plan) prepared for and referenced in the Consent Decree forms the basis for operations, maintenance, and monitoring at the L&RR Site through the year 2025. The analytical requirements, including methods, detection limits, and deliverables required are outlined in Section 10.0 and related portions of the PC O&M Plan. A previous submittal, the *Operation and Maintenance (O&M) Manual for Landfill Gas Treatment System* (Emcon, May 1995) and recently submitted *Operating Manual for John Zink Company's Condensate Injection System* (John Zink Co., December 1998) are incorporated by reference as part of the PC/O&M Plan.

At the Settling Defendants' request, the manufacturer of the flare system performed an assessment of the system with respect to Y2K compliance. The Settling Defendants provided a letter dated June 1, 1999, certifying that they do not anticipate Y2K impacts at the site.

Operation, Maintenance and Monitoring for the Site is conducted by the L&RR Settling Defendants in accordance with the Consent Decree, its associated Statement of Work and the approved Post-Closure Operation and Maintenance Plan. Activities covered by this plan along with a brief description of their status include:

1. Landfill Inspection and Maintenance

This work includes:

- maintain perimeter security;
- inspect cover and drainage features for evidence of problems so that appropriate actions can be taken;

- inspect groundwater monitoring wells for integrity;
- inspect gas collection wells and header piping for settlement and physical damage; and,
- monitor landfill settlement.

The landfill cover, drainage structures and sediment are inspected on a monthly basis. Any trouble signs are reported in the Inspection Reports provided to EPA and RIDEM in the Monthly Progress Report and are corrected in a timely manner. The rip-rap areas of the landfill cover, the fenceline and the access road are periodically treated with vegetation control. The vegetative areas of landfill cover are treated with slow-release fertilizer and grub control.

No problems with drainage structures or siltation of the sediment basins have occurred. In July, 1997, a portion of the landfill cover on top of the landfill, approximately 75 feet by 30 feet, subsided two to three feet. Repairs to the subsided area, including installation of a new section of impermeable liner were performed in August, 1997.

2. Landfill Gas Extraction and Treatment System Operation

This work includes:

- monitor 18 gas wells monthly to maintain equilibrium between methane generation and methane destruction;
- monitor oxygen concentrations; and,
- monitor flare inlet to ensure that combustion efficiencies can be maintained.

The system is operated to maintain a negative pressure across the landfill and control methane migration. Vacuum data and methane concentrations at each wellhead are measured at least monthly and are submitted in the Monthly Progress Reports to EPA and RIDEM as part of the gas extraction system operating data. In general, the system is under negative pressure. When occasional positive pressure is noted, adjustments are made to the system, and checked within a few days to verify the effectiveness of the adjustments. The flare is operating at an average rate of approximately 430 cfm.

3. Methane Migration Monitoring

- Monitor three landfill gas probes to evaluate the effectiveness of the extraction system to control gas migration.

Methane migration monitoring data submitted to EPA and RIDEM on a monthly basis documents general compliance with the action level of 1.25% methane content. There are occasions when the methane level in a particular monitoring probe will temporarily exceed the action level due to either temporary shut down of the flare for maintenance, or an extraction well being temporary inoperative due to a hyper-extended flex hose. In each case, the methane levels in the migration probes following the well repair or flare maintenance typically return to less than 1.25% within two weeks.

4. Flare Performance Monitoring

- Perform tests necessary to ensure that the 6' x 40' enclosed flare is operating at the appropriate efficiencies and that flare emissions are compliant with Rhode Island Air Toxics Regulation No. 22 (RIAT).

Flare performance tests and modeling of maximum emission impacts, conducted in January, 1995 and February, 1996 document compliance with RIAT. From January, 1995 through December, 1998, the condensate generated from the operation of the landfill gas collection system, was collected in three condensate sumps which were automatically emptied via level controlled pneumatic pumps and discharged to a 2,500 gallon double-wall underground storage tank. Condensate from the storage tank was emptied on a regular basis and transported to the PSC Industrial Resources facility in Warwick, Rhode Island for treatment and disposal.

In November, 1999, the Settling Defendants submitted a Work Plan for an alternate condensate management option consisting of on-site condensate injection into the flare system, citing advantages of turnkey management of the condensate. Following EPA and RIDEM approval, in December, 1998 the condensate injection system was installed by John Zink, Co. A flare performance test both with and without the condensate injection system in operation was performed in March, 1999. The results of the stack testing and modeling of maximum emissions results demonstrate that the system is in compliance with RIAT both with and without condensate injection. The condensate injection system continues to operate at a rate of about 1,000 gallons injected weekly.

The flare is inspected on a semi-annual basis by a representative of the manufacturer and the flare inspection reports are submitted to EPA and RIDEM with the Post-closure Site Monitoring Reports. There have been no major problems associated with the flare since its installation in January, 1995. Flare performance tests are planned to be conducted every 5 years following this Five-Year review.

5. Groundwater Monitoring

- Monitor groundwater quality to observe changes over time in the anticipated direction of groundwater movement.

A network of seven monitoring wells, including two background wells, has been sampled every four months from October, 1996 through March 1999, in accordance with the Post-Closure Operation and Maintenance Plan. Validated data from these sampling events has been submitted to EPA and RIDEM in the Post-Closure Site Monitoring Reports. A statistical analysis of groundwater data trends from 1996 through 1998 sampling events was prepared and submitted in February 1999 Post-Closure Site Monitoring Report. Some variations in the concentrations of certain compounds have been observed, including both decreasing and increasing trends in the same wells. Overall, the pattern of groundwater quality remains stable, indicating that the landfill cap is working effectively to minimize exceedances of groundwater standards. Based on these results, EPA and the State will continue review of the groundwater monitoring program and, will discuss with Settling Defendants any modifications to the monitoring well network, as warranted (see Recommendations Section below).

Starting with October, 1999, the groundwater sampling frequency will be semi-annual and is expected to be annual from fiscal year 2007 until the end of the thirty year program. The frequency of sampling may be adjusted in the future on the basis of the data reviews.

6. Surface Water Monitoring

- Monitor surface water at potential discharge locations for changes in water quality.

Since May 1997, semi-annual surface water sampling is performed at six defined locations. Two of these locations, at the toe of the landfill, have been typically dry. No levels of concern have been found and no trends in the surface water quality have been observed. Surface water samples are planned to be collected annually for the remaining 25 years of the program.

7. Ambient Air Monitoring

- Monitor ambient air to confirm that the remedy is protective.

Ambient air data has been collected in combination with flare performance test monitoring and modeling. Additionally, annually, ambient air monitoring at the perimeter of the landfill at four locations is performed on an annual basis to evaluate the possibility of fugitive emissions from the site. Data from two monitoring events conducted in June, 1997 and July, 1998 show concentrations below the Acceptable Ambient Levels established in the RIAT.

Demonstration of Quality Assurance and Quality Control: Activities at the Site were consistent with the ROD, the RD/RA statement of work included with the Administrative Order and the Consent Decree, requirements of the Quality Assurance Project Plan (QAPP) and incorporated all EPA and State quality assurance and quality control (QA/QC) procedures and protocol. EPA CLP equivalent analytical methods were used for all validation and monitoring samples during RA and post-closure activities. All procedures and protocols were followed for sample analysis

The Settling Defendants have addressed deficiencies noted in the Site inspections. Therefore, EPA and the State determined that all analytical results are accurate to the degree needed to assure satisfactory execution of the RA and O&M and consistent with the ROD and Post-Closure O&M Plan.

3.0 Document Review

The documents listed under Reference Section of this Five-Year Review were reviewed and utilized to help evaluate the effectiveness of the selected remedial action with respect to adequately protecting human health and the environment.

The Administrative Record for the Site is located at the EPA Region I Records Center, 1 Congress Street, Boston, Massachusetts 02114 and at the North Smithfield Municipal Annex Building, 85 Smithfield Avenue, North Smithfield, Rhode Island.

4.0 Results of Site Visit

A site visit by EPA was conducted on June 24, 1999, during a semi annual flare inspection for the purposes of this Five Year Review. No significant deficiencies requiring immediate maintenance or correction were revealed by the inspection. The following is a summary of the findings and conclusions of this inspection:

- The Site is fenced with gates locked.
- No significant erosion was observed on landfill cover and surface water management structures; cover integrity was in good condition.
- Surface water management structures were found in good condition and are functioning as designed.
- Monitoring wells observed during the visit were capped and locked; gas wells appeared in proper working order with no physical damage.
- Landfill gas extraction system and the Flare are in good operating condition with exception of the stack exterior paint which requires re-coating.

5.0 Review Summary

The conclusions of this Five Year Review are summarized below. The documentary review and interviews with EPA and State personnel support these conclusions.

- The closure of the landfill was performed according to the requirements of the 1988 Record of Decision.
- Under the 1997 Consent Decree, the Settling Defendants perform operation, maintenance, and monitoring of the Site in accordance with the requirements of the Post-Closure Operation and Maintenance Plan. EPA and the RIDEM conduct review of the reports and data submitted by the Settling Defendants as documentation of the on-going post-closure activities.
- Remedial Action Report and Preliminary Close Out Report document that the Settling Defendants have constructed the remedy in accordance with remedial design plans and specifications and the remedy is operational and functional.

6.0 Recommendations

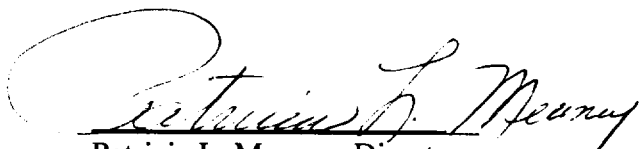
- Finalize implementation of the Institutional Controls required by the Settlement Agreement and Consent Decree.
- Continue discussion with the Settling Defendants regarding groundwater monitoring program, including potential installation of two new sentinel wells on abutting property downgradient from the landfill.
- Continue evaluation of the groundwater monitoring data and exceedances of Maximum Contaminant Levels (MCLs), including periodic statistical analysis and hydrogeologic setting of the Site to monitor effectiveness of the landfill cap.
- Assist RIDEM and other EPA's program in evaluation of potential impacts from the Site on new land development considered by the Town of North Smithfield in a vicinity of the Site, such as power plant and industrial park.

7.0 Statement of Protectiveness

I certify that the remedy selected for this Site remains protective of human health and the environment.

8.0 Next Five-Year Review

The next five-year review will be conducted by year 2004.



Patricia L. Meaney, Director
Office of Site Remediation and Restoration
EPA Region 1 - New England

9/10/99
Date

ATTACHMENT A

Photographs

June 24, 1999 Site Visit - Landfill and Resource Recovery Superfund Site

Photograph Number	Description
1.	Semi Annual Flare inspection by John Zink Company
2.	Enclosed Flare Stack
3.	Condensate Injection System (injector gun)
4.	Flare and control building
5.	Flare control panel
6.	View from the Landfill onto the flare area
7.	One of the landfill gas collection wells
8.	Landfill vegetative cover

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Region 1 - New England, Boston, Massachusetts, September 16, 1996.

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